LUND UNIVERSITY
Electrical and Information Technology

Home Exam in Internet–Techniques and Applications, EITF25

December, 2013

Name: ______________________

Id Number: ______________________

Programme: __________

Nbr of sheets: __________

Mark with a cross the problems you solved.				
1	2	3	4	5

Signature: ______________________

Control protocol					
1	2	3	4	5	$\sum$

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- Write your name on each paper.
- Start a new solution on a new sheet of paper. Use only one side of the paper.
- Solutions should clearly show the line of reasoning.

Good luck!

Note: In Figure 5.1 a network is shown that will be referred to in Problem 1, 4 and 5. The picture can also be found on the course web site next to the exam.

Problem 1

The below questions are related to the network diagram in Figure 5.1, when the Gadget is a switch

(a) Identify ALL IP networks.

(b) The DHCP server in router 1 is just switched on and needs your help assign IP addresses. Assign relevant IP addresses to all affected computers. What additional information is provided by the DHCP-server as it assigns IP addresses?

(c) Specify the network id of the mobile phone and its IP mask.

(d) How many addresses (net IDs) can network 1 hold? I.e. how many computers can be hosted simultaneously, each with unique IP addresses, in that network?

(e) Explain why MAC addresses cannot be used to communicate across network and justify the parallel existence of MAC and IP addresses.

(2+2+2+2+2=10p)

Problem 2

Given the forwarding table below, what is the next hop address for these destination addresses?

(a) 130.235.128.100

(b) 191.231.194.72

(c) 100.100.12.192

Motivate your answers.

Net ID	Cost	Next Hop
130.235.0.0/16	5	81.12.32.4
191.231.194.0/26	2	129.100.1.1
84.24.0.0/22	1	181.14.62.5
100.100.12.160/27	3	4.235.17.9
191.231.194.0/24	1	73.32.56.123
0.0.0.0/0	1	112.123.89.1

(3+4+3=10p)

Problem 3

Given the routing tables of 8 routers (A to I) below:

	A			B			C			D			E			G			H			I	
d	*c*	*n*	*d*	*c*	*n*	*d*	*c*	*n*	*d*	*c*	*n*	*d*	*c*	*n*	*d*	*c*	*n*	*d*	*c*	*n*	*d*	*c*	*n*
A	0	-	A	1	-	A	2	B	A	2	-	A	4	-	A	4	D	A	6	E	A	8	C
B	1	-	B	0	-	B	1	-	B	3	A	B	5	A	B	5	D	B	7	E	B	7	C
C	2	B	C	1	-	C	0	-	C	4	A	C	4	-	C	6	D	C	6	E	C	6	-
D	2	-	D	3	A	D	4	B	D	0	-	D	6	A	D	2	-	D	5	G	D	8	H
E	4	-	E	5	C	E	4	-	E	6	A	E	0	-	E	5	H	E	2	-	E	4	-
G	4	D	G	5	A	G	6	B	G	2	-	G	5	H	G	0	-	G	3	-	G	6	H
H	6	E	H	7	C	H	6	E	H	5	G	H	2	-	H	3	-	H	0	-	H	3	-
I	8	E	I	7	C	I	6	-	I	8	G	I	4	-	I	6	H	I	3	-	I	0	-

d = destination; *c* = cost; *n* = next hop

(a) Draw the network graph, showing all the routers and the links with their costs.

(b) Now, let router B disappear from the network. Assume that all the remaining routers have received that information with the help of the link state information advertised by routers A and C. Run Dijkstra's algorithm on router G after the change in the network, showing step by step how G's least cost tree is built. (Do not forget to show how you made your decisions at each step.) Show G's updated routing table.

(5+5=10p)

Problem 4

In for example gaming and video conversations the delay of the network is an important parameter. In gaming the maximum delay of course depends on the game, but in general terms not more than a couple of hundreds milliseconds are acceptable as total round trip delay (two way delay).

In the network in Figure 5.1, assume a person in the home network plays an online game and is connected to the Game server. The path for the packets through the network, and the link data, is given below.

Network	Type	Uplink	Downlink	Length
1	ADSL	1 Mbps	8 Mbps	3 km
3	Fibre	10 Gbps	10 Gbps	25 km
4	Fibre	10 Gbps	10 Gbps	L
6	GPON	1 Gbps	2.5 Gbps	10 km
Lan 130.120.6.1/24	1000BASE-T (208.3ab)			50 m

The length of Net 4 will be specified below in the question.

When deriving the delays you can assume that the internal processing in the equipment (routers, switches and computers) is negligible, but a packet cannot be transmitted on the output side until the complete packet is received. However, both the transmission time and the propagation time should be taken into account. For both fibre and copper the propagation speed is approximately 2/3 of the speed of light in vacuum.

Assume that the gadget in the figure is the residential gateway of the home network and the interesting round trip time is from the Gadget to the Game server and back. The game normally transmits packets with IP payload 1400 bytes. If the maximum round trip delay is about 100 ms, can the Game server be located in

- Stockholm?
- Italy?
- USA?
- Australia?

Assume that Router 2 is located in Lund.

(10p)

Problem 5

Consider the network given in Figure 5.1. Assume that the client computer Desktop 1 just connected to the network.

(a) Specify all collision domains and in which communication media they are present.

- when the Gadget is a hub.
- when the Gadget is a switch.

(b) What sequence of events will automatically take place initiated by the computers operating system to prepare the computer for network communication? Who are the senders and receivers of any potential network communication, and at which OSI level they are occurring.

(c) "Desktop 2" has empty ARP and DNS tables, but wants to send a request to www.net6.com. List all messages invoked in the request. Including type, destination and source MAC and IP addresses, sent over the link emanating from "Desktop 2".

(3+3+4=10p)

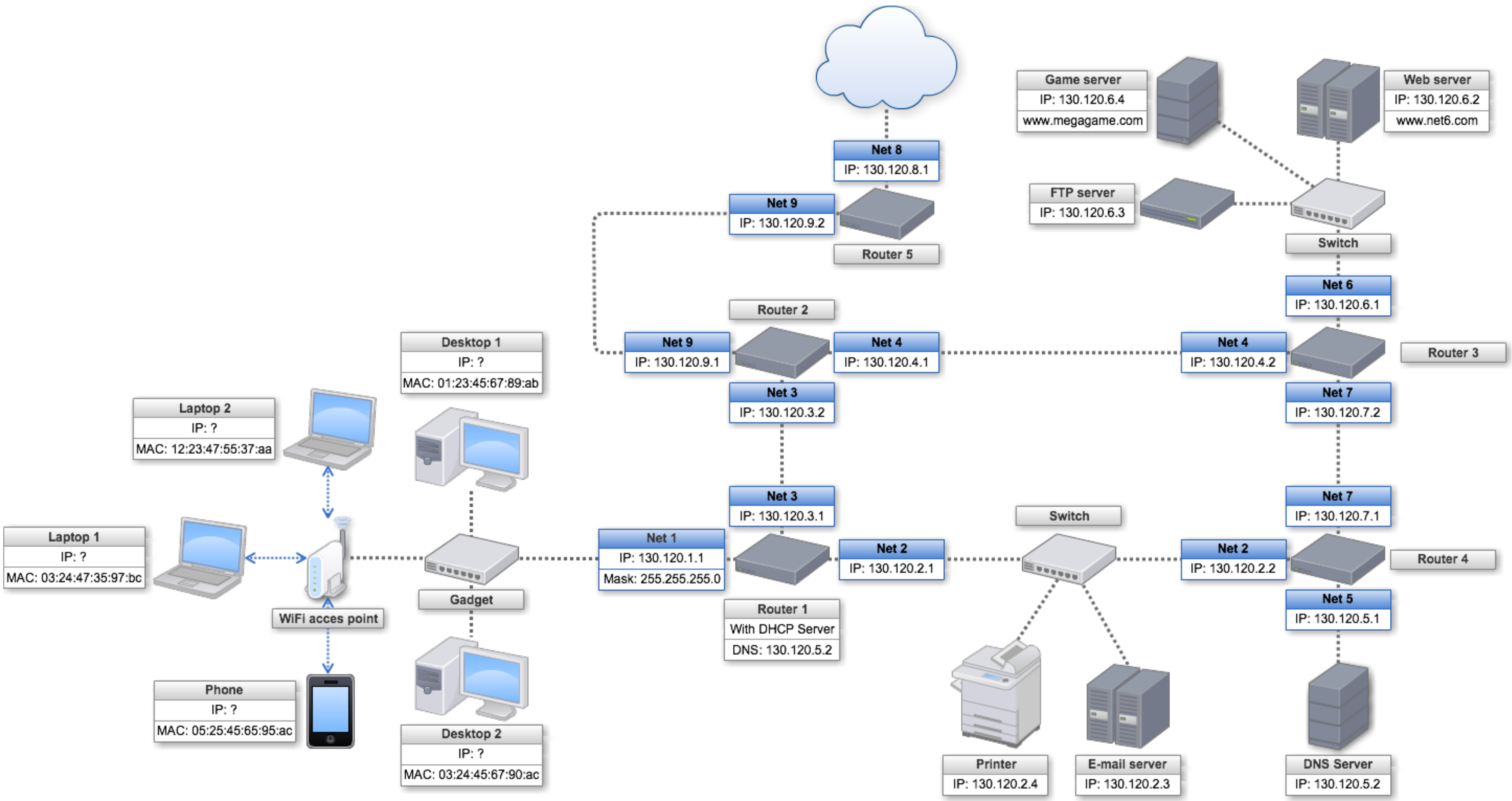

Figure 5.1: A network representing the world in problems 1, 4 and 5.